CASE REPORT

Hibernoma: diagnostic and surgical considerations of a rare benign tumour

Alissa Greenbaum,¹ Brittany Coffman,² Ashwani Rajput³

¹Department of Surgery,
University of New Mexico
Health Sciences Center,
Albuquerque, New Mexico,
USA

²Department of Pathology,
University of New Mexico
Health Sciences Center,
Albuquerque, New Mexico,
USA

³University of New Mexico
Health Sciences Center,
Comprehensive Cancer Center,
Albuquerque, New Mexico,
USA

Correspondence to
Dr Alissa Greenbaum,
agreenbaum@salud.unm.edu

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SUMMARY

Hibernoma is a rare, benign tumour of brown fat origin. Less than 250 cases have been reported in the literature. We present a case of a 19-year-old man referred to surgical oncology for evaluation of a large soft tissue mass near the apex of his right scapula. Complete surgical excision was performed, sparing the overlying latissimus dorsi musculature. Surgical pathology revealed findings were consistent with hibernoma, grossly showing a well-encapsulated fluctuant mass measuring 21.4×14.4×5.3 cm, and histologically composed of brown fat adipocytes. The mainstay of treatment is surgical excision of the mass. Primary goals of the operation include complete removal of the mass to prevent recurrence and sparing of adjacent structures as it is a benign, non-invasive tumour. We present a case of a large chest wall hibernoma in a young adult, diagnosed on final pathology after complete surgical excision.

BACKGROUND

Hibernomas are uncommon, benign tumours of brown fat origin. Though previously debated, the natural history of these lesions is decidedly benign, with no reported cases of metastasis or related mortality. Since first described by Merkel¹ in 1906, <250 cases have been reported in the literature.² Hibernomas present clinically as an asymptomatic soft tissue mass, affecting patients of all age ranges.³ Previous literature postulated that hibernomas originate in areas where brown fat resided in infancy, though it has been found that these lipomatous masses can occur anywhere in the body.^{2–4} Bothersome symptoms develop when the mass compresses adjacent structures. Differential diagnoses may include benign lipoma or malignant liposarcoma. The mainstay of treatment includes complete surgical excision. We present the case of a young patient diagnosed with a very large soft tissue posterior chest wall mass, found on surgical pathology postoperatively to show classic findings of hibernoma on gross and histopathological inspection.

CASE PRESENTATION

A 19-year-old man was referred to surgical oncology for evaluation of a large soft tissue mass near the apex of his right scapula. He and his mother first noted the mass 2 years prior. It continued to grow in size and extend into his right axilla. He denied associated pain or functional limitations, though could not fully adduct his upper extremity secondary to the protrusion of the mass. He denied

constitutional, respiratory or gastrointestinal symptoms. He had no prior surgical history. His family history was significant for distant relatives (great-grandparents or great-aunt) with a history of leukaemia, colon, breast and lung cancers, though no immediate family members had a history of malignancy. An MRI performed at the referring facility showed a heterogeneous fat-containing mass insinuating along the lateral aspect of the right chest wall and inferior shoulder (figure 1A, B). The mass measured 13×9.5×18 cm and resided under the latissimus dorsi muscle. It was noted not to invade the underlying bone or inferior rotator cuff, though the anterior medial margins of the mass surrounded the neurovascular bundle in the right superior axilla and elevated the cephalic vein. He was referred to surgical oncology to evaluate for possible excision of the mass. On physical examination he was found to have a soft, non-tender and somewhat fixed right posterior chest wall mass, occupying a large space from the medial scapula extending to the anterior axillary line. The overlying skin demonstrated no evidence of erythema or ulceration.

INVESTIGATIONS

Preoperative laboratory testing showed no evidence of metabolic derangement (electrolyte, blood urea nitrogen and creatinine within normal limits) or infectious component (white blood cell count 7400 with normal differential).

DIFFERENTIAL DIAGNOSIS

Differential diagnosis at the time of presentation included atypical lipoma, angiolipoma or liposarcoma of the right chest wall.

TREATMENT

The patient underwent resection of this right chest wall tumour 3 weeks after his initial evaluation. An incision ~30 cm in length was required to circumferentially excise the mass. All feeding vessels were ligated and the latissimus dorsi muscle was successfully spared. The incision was closed in multiple layers.

OUTCOME AND FOLLOW-UP

The patient was discharged from the hospital on postoperative day 1. His postoperative course was uneventful except for a non-infected seroma that resolved with percutaneous drainage.

Surgical pathology gross examination revealed a well-encapsulated fluctuant mass measuring 21.4×14.4×5.3 cm, with a lobulated yellow-brown

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Figure 1 (A) Coronal view of T1-weighted MRI of the thorax without contrast, and (B) axial view of the tumour showing a right-sided, extrathoracic, well-circumscribed soft tissue measuring 13×9.5×18 cm and residing under the latissimus dorsi muscle.

greasy cut surface (figure 2A, B). Histologically the mass was composed of a mixture of both brown and white adipocytes (figure 3). The white fat consisted of characteristic unilocular lipid vacuole with eccentrically placed nuclei. The brown fat consisted of both polygonal cells with eosinophilic granular cytoplasm, and multivacuolated adipocytes. The brown fat multivacuolated cells were typical of 'hibernoma cells', demonstrating small nuclei with prominent nucleoli in the absence of atypia. There was also a background of fibrous septae with prominent stromal small vessels. To rule-out an atypical lipomatous tumour, immunohistochemical stains for MDM2 and CDK4 were performed, both which were negative.

Cytogenetics revealed an abnormal male chromosome complement with two separate populations of cells with a separate translocation, t(12;18) and t(1;17). Although numerous translocations are described among lipomatous tumours, commonly seen are translocations involving the long arm of chromosome 12. Furthermore, although translocations involving the long arm of chromosome 11 are commonly seen in hibernomas, none were identified in this case.

DISCUSSION

Hibernoma is a rare, benign soft tissue tumour of brown fat origin. Less than 250 cases have been reported in the literature. The name originates from the similar appearance of these tumours to hibernating glands in animals, which appear light

brown and lobulated.⁵ The most common sites of origin in human participants were historically thought to be areas of residual brown fat from infancy such as the neck, axilla, back and mediastinum. However, the largest case series of hibernomas to date found was 170 patients by Furlong and colleagues, who verified that the most frequent location to be in the thigh, followed by upper extremity, trunk, neck, then abdominal cavity or retroperitoneum. Dominance was demonstrated in male patients, whereas previously the literature advocated a higher prevalence in female patients.³ The brown colour of the tumour is likely created by increased vascularity and eosinophilic granular cytoplasm.⁶ Four morphological variants are commonly discussed, with the vast majority of tumours being the 'typical' hibernoma cells subtype versus myxoid, spindle-cell and lipoma-like variants.^{3 7}

Hibernomas are most commonly diagnosed postoperatively on final pathological evaluation, though interest in potential avenues for preoperative diagnosis has been recently ignited. Assurance of benign behaviour could allow providers to avoid large surgical resections, particularly in patients with multiple medical comorbidities at high risk of perioperative complications. With regard to clinical presentation, hibernomas are largely asymptomatic unless associated with compression of surrounding structures. Initial studies include a thorough history and physical examination, though findings are inevitably non-specific as many neoplasms, both benign and malignant, can

Figure 2 Surgical pathology gross examination revealed (A) a well-encapsulated fluctuant mass measuring 21.4×14.4×5.3 cm, and (B) with a lobulated yellow-brown greasy cut surface.

Figure 3 Histological examination demonstrated a mixture of both brown and white adipocytes. The brown fat consisted of both polygonal cells with eosinophilic granular cytoplasm, and multivacuolated adipocytes in a background of fibrous septae with prominent stromal small vessels, also with prominent nucleoli and absence of atypia, consistent with 'hibernoma cells' as typically described.

present similarly to hibernomas. As mentioned previously, anatomical location may help to guide diagnosis, as proximal extremities and the trunk are the most common locations for a hibernoma.^{3–7} Intra-abdominal or retroperitoneal hibernomas are rare and difficult to diagnose, presenting with vague abdominal pain, constipation or early satiety and are often incidentally found on CT scan with intravenous contrast.

Recent studies have proposed that advanced imaging can further guide preoperative diagnosis. A well-differentiated liposarcoma may have an irregular capsule with thickened septations and decreased vascularity compared with hibernomas on MRI.⁸ Dedifferentiated liposarcomas can also be distinguished from benign hibernomas, due to the presence of non-adipocytic soft tissue masses with areas of mineralisation or ossification suggesting a malignant process. Hibernomas are well-circumscribed masses on CT, appearing mildly hyperdense to subcutaneous fat, with attenuation ranging between skeletal muscle and fat.⁷ Hypothesised to be due to active thermogenesis, hibernomas are also noted to be FDG-avid on positron emission tomography scan. Hibernomas generally have decreased signal intensity compared with subcutaneous fat on T1-weighted MRI and fail to suppress on STIR or fat-saturated T2-weighted imaging.^{7–9–10} While surgical excision remains the gold standard of treatment and diagnosis, MRI or CT findings such as these may be reassuring in cases of poor surgical candidates or patients declining surgical intervention. Incisional biopsy is not recommended secondary to hypervascularity and potential for bleeding complications.¹¹

Hibernomas do not demonstrate invasive characteristics, though reports of incomplete excision secondary to close proximity with critical structures such as the axillary vessels and brachial plexus have been reported.⁶ In a case such as ours, with a trunk or extremity mass, MRI is useful to determine relationships with adjacent structures such as muscle and bone, which

can assist in preoperative planning. In most cases, the smooth, well-encapsulated mass is non-adherent during surgical dissection and full excision is achieved. Local recurrence is possible though uncommon. In a series by Beals *et al*,¹² 1 case of out 19 recurred, likely due to incomplete excision. No cases have been reported of malignant transformation of a hibernoma or distant metastasis and surgical excision, when complete, is curative.

Learning points

- ▶ Hibernoma is an uncommon, benign soft tissue tumour of brown fat origin.
- ▶ Differential diagnoses include benign atypical lipoma, and malignant liposarcoma.
- ▶ While anatomical location and advanced imaging assists in guiding preoperative diagnosis, the current mainstay of treatment is complete surgical excision. Incisional biopsy is not recommended secondary to hypervascularity of the tumour.
- ▶ The goals of surgical intervention include complete excision to prevent recurrence and sparing of adjacent structures as the tumour demonstrates benign behaviour.

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Competing interests None declared.

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